

## CLIMATE AND CROP SERVICE.

By JAMES BERRY, Chief of Climate and Crop Service Division.

The following summaries relating to the general weather and crop conditions are furnished by the directors of the respective sections of the Climate and Crop Service of the Weather Bureau:

**Alabama.**—Excessively hot and dry, and unfavorable for all growing crops. A drought, which began during middle of April, continued practically unbroken over the greater portion of the State; in some central counties absolutely no rain was received during the month.—*F. P. Chaffee.*

**Arizona.**—High, drying winds and extremely arid conditions have arrested full plant development. The harvesting of barley and wheat in the lower agricultural valleys was finished during the month. The yield was generally below the average, but the product was of good quality. The water supply for irrigation has been reduced to a minimum, and alfalfa fields have suffered correspondingly. The range interests are in a precarious condition.—*Wm. G. Burns.*

**Arkansas.**—Warm, dry weather prevailed during the first two decades of the month. A spell of abnormally cool weather prevailed from the 20th to the 25th, accompanied by local showers, heavy in some places. Heavy general rains began on the 27th, and continued intermittently until the close of the month. Conditions favored cotton; it advanced rapidly and was blooming and fruiting well. Corn suffered considerably from dry weather during the month, wilting and turning yellow. The heavy rains at the close of the month improved it, though some slight damage was done by lodging, caused by the high winds and heavy rains. Wheat has been harvested and garnered, and thrashing is progressing. Oat harvesting has been completed and thrashing had begun; the yield is from poor to fair, only a very few localities reporting an average yield. Peaches improved considerably toward the close of the month, but apples continued to fall. Pastures and gardens were greatly benefited by the heavy rains.—*Edward B. Richards.*

**California.**—Nearly normal weather conditions prevailed during the month. Fires destroyed several hundred acres of grain. Grasshoppers caused considerable damage to vineyards and grain in the San Joaquin and Sacramento valleys. Grain harvest was in progress in all sections at the close of the month, and there was a heavy yield in most places north of the Tehachapi. Deciduous fruits were yielding bountiful crops.—*Alexander G. McAdie.*

**Colorado.**—For the State as a whole the precipitation was about three-fourths of the normal. The volume of water for irrigation was exceptionally small, notwithstanding the fact that June is usually the month when the streams fed by melting snow are at very high stages. The scarcity of water was not unexpected, however, in view of the light snowfall of the past winter; there were no heavy rains in the mountains to offset the deficiency. Following the copious precipitation that occurred during the latter part of May a rapid improvement was noted in the condition of crops. This improvement, however, was of short duration. Drying winds prevailed, and as the rainfall was insufficient to make up for the absence of irrigation many fields were soon past recovery, while others gave promise of much less than normal returns. Irrigated crops made very satisfactory advancement, but the area actually irrigated was very small as compared with that of the average season. The first cutting of alfalfa was harvested during the month, the yield being generally light. Wheat, oats, and rye suffered from the drought, and grasshoppers caused considerable injury in the north-central counties. Corn and potatoes continued thrifty. The eastern ranges afforded excellent pasturage; elsewhere the grass dried rapidly and short pasturage was reported in the western and south-central counties. The conditions were favorable to fruits. Strawberries were plentiful, and a large crop of cherries was marketed. Hail was frequent during the closing days, and caused considerable damage in the north-central section.—*F. H. Brandenburg.*

**Florida.**—The month was noted for high temperatures and a decided deficiency in precipitation. There are portions of the State where no rain fell during the month. As a consequence corn has been badly damaged. Cotton on uplands was needing rain at the close of the month, although the plant made a fair growth; it fruited slowly. Tobacco, cane, velvet beans, and vegetables suffered for rain. Pineapples were shipped in large quantities; the fruit was not so fine as in former years.—*A. J. Mitchell.*

**Georgia.**—June was a warm month, with abundant sunshine, a decided deficiency in precipitation in the northern section, and large excesses in some of the southern counties. The lack of moisture in many counties was damaging to crops, but the generally fair weather afforded fine opportunity for cultivation. Cotton withstood the drought well, and at the close of the month the crop was generally in good condition, although the plants were small for the season. Upland corn, gardens, and melons were badly injured by the dry weather. Late peaches suffered extensively from shedding and rotting.—*J. B. Marbury.*

**Idaho.**—There were no storms of general character during the month,

but high, drying winds occurred in the southeast sections from the 13th to 19th, and in the northern counties from the 23d to 27th. Crops in dry farm sections suffered for want of rain, but in irrigation districts, with few exceptions, the water was more abundant than usual. Hay, wheat, oats, flax, apples, pears, and prunes are in excellent condition.—*S. M. Blandford.*

**Illinois.**—The weather was warm the first half of the month, but the latter half was unseasonably cool; showery weather prevailed throughout the month in the northern and central districts, but generally dry weather prevailed over the southern district until the end of the month, when heavy rains fell throughout practically the entire State. Crop conditions were very favorable over the northern and central districts during the greater part of the month, the showers and warm weather of the first half having caused a rapid growth of vegetation. Oats grew rank, however, and lodged to some extent, and the wet weather delayed corn plowing. In the southern district crop conditions were decidedly less favorable than farther north on account of the dry weather, but the heavy rains of the latter part of the month have caused considerable improvement.—*M. E. Blystone.*

**Indiana.**—An unusual number of severe electrical, hail, and windstorms, as well as excessive rainfalls, were recorded during the month. The planting of corn in the north section was delayed, and after it came up the crop suffered from excessive moisture. At the close of the month, however, corn was in fair to excellent condition in all sections. Clover harvest was delayed, some hay was lost and much damaged by frequent rains. Oats made splendid growth, were heavy and ripening, but badly lodged. Wheat was cut in the south section, harvest had commenced in central section and the grain was ripening in north section. Early potatoes were yielding well. The apple crop was light and the fruit falling. Strawberry, blackberry, and raspberry crops were light. Melons, tobacco, and all vegetables were doing well.—*W. T. Blythe.*

**Iowa.**—The month was unseasonably cool, wet, and cloudy, and extensive areas were flooded, causing much damage to crops on river bottoms and low lands and retarding farming operations. Continued wet weather caused a rank growth of oats, barley, and spring wheat, developing a tendency to lodge and rust. But despite the adverse conditions fair progress was made in cultivating corn, and at close of month three-fourths of the corn acreage was fairly clean and promising. Grass, potatoes, and garden truck made great advancement. The apple crop was below the average.—*John R. Sage.*

**Kansas.**—A fine month for growing crops. Wheat harvest began the first week, but owing to the excessive rains was not finished the last week. Oat harvest began the third week, an unusually fine crop. Corn grew very rapidly, with a fine stand and good color. Potatoes very abundant and fine. First crop alfalfa cut under difficulties, and much was lost; second crop fine and being saved in good condition. Hay very fine.—*T. B. Jennings.*

**Kentucky.**—During the first half of the month the temperature was about normal, and with the exception of a few of the southern and western counties, where droughty conditions prevailed, there was sufficient rainfall for the growth of crops. The latter half of the month was very cool, checking the growth of vegetation. In some of the south-central counties the drought was quite severe until the last week, when abundant rains visited all sections, generally improving crop conditions. Some localities reported damage by heavy wind and floods, but the area affected was not extensive.—*H. B. Hersey.*

**Louisiana.**—The month was unusually dry, the rainfall being insufficient for the needs of crops, except over the northwest portion of the State. Warm weather favored plant growth where rainfall was sufficient. Cotton made very slow growth over the central and southern portions of the State, and at the close of the month the plant was reported small generally and was blooming to the top. Sugar cane made very little growth during the month, and notwithstanding the drought it retained a healthy color in most sections. The plant was reported unusually small for the season and needed general rain. Rice suffered for rain, except where water was sufficient for irrigation. Early rice was maturing at the close of the month. Corn suffered seriously for the want of rain.—*I. M. Cline.*

**Maryland and Delaware.**—Brief warm spells helped crops, but the prevailing cool weather was unfavorable, and some loss to tender vegetation resulted from frosts in the extreme west. The generous rains that fell on and after the 7th were very beneficial, however, and changed the crop outlook from one of gloom to much promise. Wheat harvest progressed rapidly, giving light yields of a fine quality of grain; clover gave very poor returns; timothy improved during the month; buckwheat was about all sown in the west; oats improved; tobacco rallied to a marked extent, and the stands, though uneven, are in the main satisfactory. Fruit of all kinds fell considerably; gardens made rapid growth after the rains and yielded bountifully. The 17-year locusts have about all disappeared; they did no damage to field crops, but left the marks of their brief sojourn on fruit and forest trees.—*Oliver L. Fussig.*

**Michigan.**—The excessive precipitation interfered greatly with field work of all kinds, while the cool weather retarded the growth and germination of corn, beans, and garden truck. Cultivation of all kinds has been very backward during the entire month. Wheat, rye, oats, barley, meadows, and pastures made good progress, the cool, wet weather being very favorable until the latter part of the month, when rain became excessive and delayed the maturing of wheat, rye, and hay. Excessive moisture also delayed the planting of late potatoes and thinning of sugar beets. Corn made very poor progress, although it germinated quite nicely; at the close of the month it was small and of rather poor color. Light frosts occurred in nearly all counties of the State as late as the 26th, but the damage in most cases was confined to low ground and was slight. At the close of the month clover haying had begun, but was making very poor progress on account of the frequent showers.—*C. F. Schneider.*

**Minnesota.**—The weather was dry in the southwest till the 24th; elsewhere there were well distributed showers, some of which in the south-east were heavy enough to cause high water. A tornado on the 9th in parts of Norman, Clay, and Becker counties caused the deaths of 6 persons and damaged crops, farm buildings, etc. Hailstorms destructive to crops and buildings occurred in Renville, McLeod, Sibley, and Rice counties on the 14th. Frosts in the southwest on the morning of the 21st caused temporary injury to corn, gardens, etc. Spring wheat, oats, and barley grew well all the month. Flax seeding on new land continued into the middle of the month; the early seeded was in good condition. Most of the potatoes were planted by the 1st; they grew well and were in market by the end of the month. Corn had a good stand, but the cool weather kept it small and backward. Old timothy was good, but that seeded last season poor. Clover cutting began late in the month.—*T. J. Oudram.*

**Mississippi.**—The month was characterized by excessively high temperatures (being the warmest June on record) and a marked deficiency in rainfall except in the extreme northern counties, where the monthly precipitation was slightly above normal. At the beginning of the month crops were generally clean and in a healthy growing condition, except in some of the eastern counties, where they were commencing to need more moisture. The drought over the greater portion of the State during June almost ruined early corn, injured late corn, stopped the growth of cotton, causing it to bloom to the top, and was very damaging to minor crops. During the last week of the month cotton was further injured by the high southerly winds, and considerable early corn was being cut for fodder, except in the extreme northern counties, where copious showers proved very beneficial to all crops. Peas that were sown when corn was laid by, generally failed to germinate, and pastures, gardens, and fruit deteriorated quite rapidly on account of the dry, hot weather.—*W. S. Belden.*

**Missouri.**—Unseasonably cool weather during the latter part of the month checked the growth of corn and cotton to some extent, and heavy rains during the last decade interfered with harvest and caused some damage to standing grain and also to that in shock. Excessive rains in localities also resulted in much damage to crops on bottom lands by the overflowing of streams. Otherwise the weather conditions of the month were very favorable, and the outlook for all crops, except fruit, was most encouraging.—*A. E. Hackett.*

**Montana.**—Weather very cool during the month, which retarded the growth of crops and vegetation. The season is about three weeks later than the average.—*E. J. Glass.*

**Nebraska.**—The first half of June was warm and wet and all crops made rapid growth; winter wheat especially filled well and promised a large crop; oats made a very rank growth and in some places began to lodge slightly. The last half of June was very wet and cool; frost on the morning of the 21st damaged field crops slightly in the northern counties. The wet weather interfered seriously with the harvesting of winter wheat and caused oats to lodge badly. The heavy showers flooded the lowlands and valleys, causing considerable damage to all crops. The wet condition of the soil retarded cultivation of corn and many fields were weedy. The crop, as a rule, was in excellent condition at the end of the month, although rather small and quite uneven in size. Potatoes and grass made excellent growth and promised a very large yield. Peaches were very poor; early cherries only a light crop; apples promise much better than either peaches or cherries.—*G. A. Loveland.*

**Nevada.**—The month was very much drier than usual all over the State; temperature conditions were about normal. Irrigation water was plentiful in the eastern, western, central, and northern sections, but rather short in the south portion. The progress of all crops was rapid and satisfactory. Haying progressed throughout the month and the yield was about the average in most districts. Range grass was fairly good and live stock improved in condition.—*J. H. Smith.*

**New England.**—Weather abnormally cool, with sunshine deficient and rainfall generally in excess. Crops were backward and growing slowly. Corn promised a short crop. Gardens were good, potatoes excellent, and tobacco very promising. Apples, except Baldwins, promised an average crop of excellent quality. Peaches and pears fair crops.—*J. W. Smith.*

**New Jersey.**—Owing to low night temperatures, all crops at the close of the month were behind the seasonal average, especially corn and tender vegetation. The rainfall was the greatest since 1887, when it averaged

6.77 inches. It was badly distributed, the extreme northern portion receiving the least and the southwestern portion of the interior the greatest amounts.—*Edward W. McGinn.*

**New Mexico.**—Dry and windy, with unusually high temperatures during the last decade. A scarcity of grass and water on the stock ranges before the close of the month, and the Rio Grande dry from Albuquerque south. Very little planting on "temporal" lands on account of the drought.—*R. M. Hardinge.*

**New York.**—The month was decidedly cool and wet. Light frosts occurred in the cooler sections from the 5th to 9th and on the 23d and 24th, but did very little damage. Farm work was much delayed by wet weather, and checked growth of corn, beans, and tobacco. Sowing buckwheat and planting beans were backward, and the hay harvest was also hindered, and the crop light. Peaches, pears, and plums were largely destroyed by frost in May, but many correspondents report the crop of late apples as very promising. Considerable damage was done by floods.—*R. G. Allen.*

**North Carolina.**—During the first two weeks of the month the progress of vegetation was seriously impeded by drought. During the latter half of the month conditions changed for the better, rains having been general on the 15th and 16th, and during the remainder of the month in sufficient quantities to repair previous damage. Early planted cotton did not suffer to any material extent. Corn stood the drought well, and under the influence of generous rains was coming into silk and tassel rapidly at the end of the month. Tobacco suffered severely, and while it was benefited by the rain did not come out well in some sections. Gardens suffered severely, and a full crop of sweet potatoes could not be planted on account of the scarcity of slips.—*R. M. Geddings.*

**North Dakota.**—The month, although cooler than usual, was very favorable for crops of all kinds, except corn, for which there was not sufficient sunlight and warmth. Wheat, rye, oats, barley, flax, and grass were all in excellent condition.—*B. H. Bronson.*

**Ohio.**—Grain lodged by the storms and harvesting delayed; corn backward in the north; oats improving and heading well; clover cutting delayed; timothy, pastures, and grass improved, but can not overcome effects of early drought; early potatoes promising; gardens and tobacco doing well; apples continue dropping; pears variable; peaches light; grapes promising.—*J. Warren Smith.*

**Oklahoma and Indian Territories.**—The weather during the month was favorable for the progress of farm work and advanced the growth of crops until toward the close of the month, when some damage was done to corn and gardens by hot, drying winds. The precipitation was light over Oklahoma, but fairly well distributed, and fell when most needed; over Indian Territory the precipitation was generally in excess of the usual amount and farm work was delayed by wet ground. Wheat harvest was well advanced and thrashing in progress at the close of the month, with yields ranging from poor to good and the grain short in weight and of medium quality. Oat harvest about completed. Corn, cotton, castor beans, millet, flax, cane, kafir, and broom corn were in good condition. Early apples, peaches, and plums matured and were yielding well.—*C. M. Strong.*

**Oregon.**—The weather during the month was generally favorable for the growth of vegetation, but a trifle too cool for the rapid advancement of spring wheat, corn, and garden truck. Haying became general during the second week; fall grain headed during the latter part of the month.—*Edward A. Beals.*

**Pennsylvania.**—The month as a whole was cold and wet. Seeding, planting, and germination were retarded and but few crops made normal advancement. The average precipitation exceeded that of any corresponding month in the fifteen years covered by the records, and the mean temperature was, with the exception of June, 1897, the lowest mean for this month during the same period. A few flakes of snow were noted in Washington and Center counties on the 23d. Light frost was recorded at widely separated points on various dates between the 6th and 25th and heavy frost at Wellsboro on the 9th. At the close of the month wheat harvest was in progress in some districts, and, though the straw was short, the heads were generally well filled and the grain of good quality; oats were improving and heading and the outlook was favorable for a fair crop; the second crop of hay had started nicely and a satisfactory yield was anticipated; pastures were furnishing ample feed; a large acreage had been prepared for buckwheat and some fields sown; garden truck and other vegetables were making little if any advancement and higher temperatures and sunshine were needed to insure proper development and maturity.—*T. F. Townsend.*

**Puerto Rico.**—All crops of the island were more or less injured, some partially, others totally destroyed, by the heavy and continuous rains that fell during the first three weeks of the month and by the lack of sunshine and cultivation; crops along the river banks were damaged or destroyed by overflows. Weather conditions improved during the last week; field work was generally and actively resumed, and crops are now rapidly recovering. The cane crop suffered very severely; mature canes deteriorated, newly cut fields failed to rattoon well, and the young canes were checked in their growth. Coffee trees in some places shed a large per cent of their berries and blossoms were damaged by the heavy rains. Some loss to the corn crop, as it was impossible to harvest it; beans and frijoles almost wholly lost, but the rice crop did well.—*E. C. Thompson.*

In the following table are given, for the various sections of the Climate and Crop Service of the Weather Bureau, the mean temperature, the stations reporting the highest and lowest temperatures with dates of occurrence, the stations reporting greatest and least monthly precipitation, and other data, as indicated by the several headings:

Summary of temperature and precipitation by sections, June, 1902.

Section.	Temperature—in degrees Fahrenheit.						Precipitation—in inches and hundredths.					
	Section average.	Departure from the normal.	Monthly extremes.				Section average.	Departure from the normal.	Greatest monthly.		Least monthly.	
			Station.	Highest.	Date.	Station.	Lowest.	Date.	Station.	Amount.	Station.	Amount.
Alabama	80.8	+2.5	Decatur	106	12	Valley Head	47	22	Tuscumbia	4.81	Verbena	0.00
Arizona	81.6	+1.7	Aztec	125	22	Ashville	23	23	Fort Huachuca	1.03	Many stations	0.00
Arkansas	77.5	0.0	New Gascony	105	19	Oregon, Wiggs	42	23	Eureka Springs	9.28	Lake Village	0.59
California	70.2	+0.3	Volcano	129	23	Bodie	10	2	Crescent City	1.93	Many stations	0.00
Colorado	63.4	0.0	Blaine	110	26	Breckenridge	14	21	Wray	5.69	Buenavista	0.00
Florida	80.7	+0.8	Eunice	103	30	Quincy	53	3	Pinemount	15.01	Molino	0.00
Georgia	79.5	+1.4	Rome, Tallapoosa	103	12	Ramsey	49	23	Waycross	9.59	Tallapoosa	0.70
Idaho	60.0	-0.1	St. Marys	30	30	Forney	21	5	Murray	1.69	Blackfoot	T.
Illinois	69.5	-3.0	Garnet	106	9	Lanark	38	22	Mattoon	14.83	Equality	1.84
Indiana	69.6	-2.6	5 stations	100	11-15	4 stations	39	23	Rensselaer	13.90	Evansville	3.17
Iowa	65.2	-4.8	Washington	101	12	Vincennes	14	14	Grundy Center	16.04	Sheldon	1.46
Kansas	70.9	-3.3	Keosauqua	97	10	Sibley	32	22	Columbus	12.45	Laktu	0.48
Kentucky	73.4	-1.3	Gove	106	10	Ahlene	34	20	Taylorsville	7.63	Franklin	1.40
Louisiana	81.6	+2.0	Viroqua	101	12	Achilles	21	21	Plain Dealing	12.52	Sugartown, Venice	0.00
Maryland and Delaware	70.1	-1.3	Bowling Green	101	11, 12	Manchester	89	22	Sudlersville, Md.	9.00	Clearspring, Md.	1.89
Michigan	59.8	-4.6	5 stations	103	10, 11, 12	Amite, Robeline	50	23	Ball Mountain	10.40	Thomaston	1.13
Minnesota	61.3	-4.0	Bootherville, Md.	104	14	Deer Park, Md.	31	8, 24	Pleasant Mounds	8.53	Bernidji	1.09
Mississippi	81.4	+2.4	Jackson	94	15	Wetmore	25	5	Austin	6.19	Shocoe	T.
Missouri	70.9	-3.2	Currie	94	15	Tower	29	23	Mount Vernon	12.55	Lamonte	2.55
Montana	56.5	-3.0	Aberdeen	106	6	Duck Hill	47	23	Lewistown	6.00	Dell	0.16
Nebraska	66.4	-3.2	St. Charles	100	11	Edwards	37	22	Wilber	12.89	Springview	1.40
Nevada	66.3	+1.1	Billings	100	9	Yale	21	2	Eureka	0.30	Several stations	0.00
New England	61.3	-3.6	Madrid	105	10	Lynch, Nesbit	31	21	Newport, Vt.	8.51	Boston, Mass.	1.77
New Jersey	67.5	-2.2	Rioville	116	24	Palmetto	20	1	Woodstown	10.21	Layton	4.54
New Mexico	72.7	+2.1	Nashua, N. H.	94	3	Fort Fairfield, Me.	20	1	Carlsbad	3.54	Deming, Galisteo	0.00
New York	61.3	-4.2	Norwalk, Conn.	99	13	Layton	38	24	South Kortright	8.41	Greenwich	3.02
North Carolina	74.5	+0.1	Vineland	99	13	Winsors	27	23	Settle	9.72	Kittyhawk	1.68
North Dakota	58.0	-5.4	San Marcial	113	25	Axtion	28	6, 11	Falconer	6.30	New England City	1.00
Ohio	66.9	-3.3	Primrose	92	3	Linville	36	9	Wellington	10.88	Kilbuck	3.21
Oklahoma and Indian Territories	77.4	+0.2	Southern Pines	103	12	New England City	28	8	Tablequah, Ind. T.	6.98	Fort Sil, Okla.	0.20
Oregon	60.4	0.0	Napoleon	97	9	Dunsleth, Gallatin	21	21	Bay City	3.83	Several stations	0.00
Pennsylvania	66.0	-2.7	4 stations	98	12, 13, 15	Orangeville	33	9	Mauch Chunk	8.93	Lock No. 4	3.35
Porto Rico	79.4	0.0	Headton, Ind. T.	110	25	Blackburn, Okla.	43	21	Perla	33.30	Arecibo	4.60
South Carolina	73.5	+0.6	Ryan, Ind. T.	102	23	Taloga, Okla.	22	22	Trenton	8.11	Cheraw	1.39
South Dakota	62.6	-5.0	Beulah	102	23	Silverlake	22	17	Howard	6.87	Spearfish	1.08
Tennessee	75.3	+0.1	York	97	12	Bend	21	21	Silverlake	10.08	Chattanooga	1.33
Texas	83.0	+2.6	Morovis	98	4	Wellsboro	32	9	Nacogdoches	14.22	8 stations	0.00
Utah	66.9	+1.5	Liberty	105	12	Adjuntas	55	9	Meadowville	0.90	11 stations	0.00
Virginia	71.4	-1.1	Hotch City, Rosebud	103	9	Santue	52	10	Bigstone Gap	7.15	Cliftonforge	1.15
Washington	59.3	-0.7	Tracy City	107	12	Ashcroft	24	20	Clearwater	5.17	3 stations	0.00
West Virginia	68.0	-2.5	Cottula	116	28	Erasmus	38	23	Powellton	8.49	Rippon	2.45
Wisconsin	61.9	-4.6	Bedford City	102	10	Tulia	43	21	Darlington	8.50	Wausaukee	1.54
Wyoming	60.1	+0.2	St. George	114	20-22	Loa	21	1	Chugwater	4.43	Basin	0.24
			Pasco	101	8	Burkes Garden	34	9, 23				
			Logan	100	12	Republie	27	6				
			Koepenick	94	13	Terra Alto	33	9				
			Basin	103	9	Butternut, Koepenick	29	23				
						South Pass City	11	3				

**South Carolina.**—Over all but the extreme eastern, northeastern, and extreme western portions, the rainfall was ample, at a few points excessive. The weather was, on the whole, favorable for harvesting and thrashing wheat and oats, except that some oats in the shock were slightly damaged by rain. Tobacco curing was begun about the middle of the month, but made slow progress. Corn and cotton prospects were the best in many years. Peaches and melons ripened and were largely marketed, the former a moderate and the latter a large crop.—*J. W. Bauer.*

**South Dakota.**—The weather conditions were favorable for spring wheat, oats, barley, rye, spelt, and grasses. Cool weather, however, kept corn backward. On the 21st heavy frost over large areas seriously injured and set back many fields of corn and potatoes, but subsequent favorable weather improved their condition. Some fruit, flax, and early barley were also injured by the frost. A severe straight gale occurred in the evening and night of the 24th over portions of Bon Homme, Clay, Hand, Hutchinson, Lincoln, Turner, Union, and Yankton counties, causing heavy loss in barns and other farm out-buildings, trees, and windmills, and damaging some farm dwellings and also some business and other houses in several small towns. One person was killed and several were injured. The gale also damaged tree fruits, lodged considerable small grain, and temporarily injured some corn. The month closed with the outlook for small grains very gratifying and the prospect for a fine crop of hay excellent.—*S. W. Glenn.*

**Tennessee.**—The rainfall was deficient during most of the month, except in scattered sections, where heavy local rains fell; good rains came near the close of the month. Vegetable crops, mostly in the middle section, were the chief sufferers from lack of moisture; corn, cotton, and

tobacco made excellent progress during the entire month. The weather was generally favorable during the harvesting season. The wheat yield was poor in quantity, but the quality of the grain was generally very good. At the close of the month apples were scarce and peaches promised a short crop.—*Roscoe Nunn.*

**Texas.**—The weather was unfavorable for the growth of vegetation throughout the greater portion of the State until the last decade of the month, owing to high temperatures and hot, drying, southerly winds. The heavy and widely spread rains, the result of the Gulf storm from the 26th to 28th, materially changed conditions and caused a rapid and marked improvement in all crops that were not too far gone to be benefited. There were small areas over the northwestern and southwestern portions of the State and along the Rio Grande Valley where little or no rain fell, and in these sections the droughty conditions that had continued during the previous month were becoming serious. At the close of the month a decided improvement was noted in cotton, which began opening in southern counties and picking was begun, the first bale of the season having been ginned on the 28th. Little damage from boll weevil or other insect pests was reported. Corn continued to deteriorate and when the rain came many fields of the early planted were too far gone to be benefited and a considerable acreage was cut for forage; late planted corn was greatly revived by the rains and at the close of the month was generally promising. Rice showed a marked improvement after the heavy rains, which furnished ample water for irrigation. Trucking interests suffered severely during the drought and the season for some of the early vegetables was shortened from one to three weeks.—*Edward H. Bowie.*

*Utah.*—Unusually warm weather prevailed from the 8th to 13th and from the 21st to 24th. Light frost occurred in elevated regions of the State on the 2d and 3d, and of the northern counties on the 18th. Potato vines and tender plants were nipped, but no serious damage done. With the exception of the north-central part of the State, the rainfall was too light to be beneficial. Dry land wheat was badly damaged by drought, and over the greater portion of the State will be a failure, or nearly so. The ranges are in poor condition. Irrigated crops did well.—*L. H. Murdoch.*

*Virginia.*—The month was not favorable for crop growth. Beginning with the 1st and continuing with but few interruptions until the last decade the weather was cool and entirely too dry for crops to make seasonable advance. Light frosts occurred on various dates, both early in the month and again between the 21st and 23d doing some slight damage.—*Edward A. Evans.*

*Washington.*—The month was cool and dry, not favorable for the best growth of crops. Frost on the 5th was heavy in some localities of the eastern section and injured tender vegetables. During the third week of the month hot weather and drying winds caused some injury to wheat, particularly spring sown wheat, on light soils and clay patches. Potatoes were slightly set back by the dry spell.—*G. N. Salisbury.*

*West Virginia.*—June was an unusually cool month. Frosts were

recorded in high altitudes on the 9th and 24th. The low temperatures had rather an injurious effect in retarding the growth of corn, but the condition of all other crops was generally improved. Heavy showers during the fourth week were generally unfavorable for harvesting. At the close of the month wheat and clover harvesting were in progress with about half yields; oats were heading, and a fair crop was expected; meadows were improving, but a light crop was anticipated; potatoes and garden truck were growing nicely; apples and peaches fell considerably during the month, and the prospect was for half a crop.—*E. C. Vose.*

*Wisconsin.*—Weather conditions were mainly favorable for crops. Frequent showers prevented proper cultivation of corn, but other crops made remarkably rapid growth. Pastures exceptionally good and stock excellent. Apples deteriorated, but small fruits generally satisfactory.—*J. W. Schaeffer.*

*Wyoming.*—Continued dry weather till the 28th of the month caused ranges to dry and burn in many sections of the State, but good rains after the 28th revived the growth of the grass, and gave good prospect for fall and winter feed, as well as increasing the prospect for a hay crop. Irrigated crops made favorable growth, and first crop alfalfa was usually up to, and in some sections exceeded, the average. Frosts did some damage to tender vegetation.—*W. S. Pulmer.*

## SPECIAL CONTRIBUTIONS.

### HANN'S METEOROLOGY.<sup>1</sup>

By Prof. FRANK H. BIGELOW.

This great work by the well known Austrian meteorologist, Dr. Hann, whose name is a guarantee for its high scientific value, is handsomely printed on large quarto pages in three kinds of type; the first covering the main course of the thought, the second many important scientific comments and references, the third an exceedingly rich bibliography of meteorology and some mathematical developments. It is well executed throughout, is very free from typographical errors, contains many fine plates of phenomena, numerous drawings, a complete index and table of contents. The book is intended to describe the state of meteorology at the end of the nineteenth century, and this large task could hardly have been performed by any one in a more satisfactory manner. The amount of labor required to digest the mass of literature which has been produced in the past thirty or forty years, since the appearance of Dr. E. E. Schmid's *Lehrbuch* of 1860, will be realized with difficulty by a non-professional reader, but it is a surprise to see how little has escaped Dr. Hann's attention, judging at least by his generous and frequent references to the work of American meteorologists, and especially of the United States Weather Bureau. It has evidently been his intention to bring forward all the important facts that may be regarded as in anywise beyond the range of speculation and controversy, and each department of meteorology is very fully exploited. At the same time every reader will be impressed with the conservative and judicial tone of the writing, so that it may be said that a safe book has been put into the hands of students who are engaged in this field of science. It will be gratifying to the meteorologists of the Weather Bureau to find the views they have advocated during the past ten years almost without exception in accord with the conclusions adopted by Dr. Hann. This makes us feel that meteorology is at last taking root in firm ground, and that its healthy growth is now assured.

The first impression regarding this work is that the book is a very large one to read, and yet, even its present size is obtained only by omitting entirely to treat such important topics as methods of forecasting, weather periods, numerous mathematical papers of physicists discussing the more purely dynamic problems, and the development of the equations of motion together with their application to the problems of atmospheric

circulation. Moreover, as one reads, there is nothing superfluous even for a professional student, and any omission would be a distinct loss to the subject; especially would one be sorry to have had the bibliography reduced to any extent. The treatment is rich in two special lines: (1) in the periodic variations of all the atmospheric elements, and (2) in the physics of static meteorology as distinct from dynamic meteorology. Such important mathematical problems as development in series, the thermodynamic relations in vertical and horizontal directions, and the barometry of the atmosphere, are suitably discussed with much clearness in the appendix, so that every student will find himself much assisted by reading Hann's treatment of these topics.

There are a number of theories, regarding the scientific truth of which doubt has existed, and it may therefore be proper to state briefly Dr. Hann's adopted views regarding them, without any discussion, since the opinions of such a master of meteorology deserve to carry much weight with them. I shall pass over many items of interest for the sake of briefly mentioning subjects of the character just indicated. The permanent gas constituents of the air, oxygen, nitrogen, carbonic dioxide, argon, helion, krypton, metargon and neon, are mixed according to Dalton's law in the lower strata, but in the same percentages in the highest strata explored, this being caused by the circulation of the atmosphere. The nuclei of condensation of aqueous vapor are ions as well as particles of dust; but the vapor is distributed by a law different from Dalton's. The solar constant may be taken as 3 gram calories, though possibly it should be advanced toward 4, but not beyond. The minimum temperature of the sun is not far from 7,000° C. The natural period of solar insolation has one maximum about 1 or 2 p. m., and one minimum about 4 or 5 a. m., but this is often converted into a double period by disturbances caused by vertical convection during the afternoon, the double period appearing in the diurnal pressure, electric potential, and vapor tension of the atmosphere. Stefan's law of the intensity of radiation  $J_0 = 0.723 \times 10^{-10} T^4$ , where  $T$  is the absolute temperature, is applicable throughout space, except as modified by the solar or planetary atmospheres. All short series of observations should be carefully reduced to the corresponding long series by suitable corrections. There is no evidence that climates have changed since the beginning of accurate observations. The old series of balloon observations by Glaisher is not comparable with those derived from modern instruments. The boiling point of water method is not available for the accurate determination of altitudes and variations of gravity, on account of the narrow range of temperature

<sup>1</sup> *Lehrbuch der Meteorologie*, von Dr. Julius Hann, Professor an der Universität zu Wien, mit 111 Abbildungen im Text, 8 Tafeln in Lichtdruck und Autotypie, sowie 15 Karten. Vorwort und Zeichnisse XIV pp. Text 805 pp. 4to. Leipzig, 1901. Chr. Herm. Tauchnitz.